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Vol. XLVII No. 4

# TRANSACTIONS OF THE AMERICAN FISHERIES SOCIETY

SEPTEMBER, 1918

Published Quarterly by the American Fisheries Society
at Columbus, Ohio

Entered as second class matter at the Post Office at Columbus, Ohio,
under the Act of August 24, 1912

# The American Fisheries Society

Organized 1870 Incorporated 1910

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# TRANSACTIONS

of the

# American Fisheries Society

"To promote the cause of fish culture; to gather and diffuse information bearing upon its practical success, and upon all matters relating to the fisheries; to unite and encourage all interests of fish culture and the fisheries; and to treat all questions of a scientific and economic character regarding fish."

VOLUME XLVII NUMBER 4

1917-1918

Edited by Raymond C. Osburn

SEPTEMBER, 1918

Published Quarterly by the Society

COLUMBUS, OHIO

# CERTIFICATE OF INCORPORATION OF THE AMERICAN FISHERIES SOCIETY

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We, the undersigned, persons of full age and citizenship of the United States, and a majority being citizens of the District of Columbia, pursuant to and in conformity with sections 599 to 603, inclusive, of the Code of Law for the District of Columbia, enacted March 3, 1901, as amended by the Acts approved January 31 and June 30, 1902, hereby associate ourselves together as a society or body corporate and certify in writing:

1. That the name of the Society is the AMERICAN FISHERIES SOCIETY.

2. That the term for which it is organized is nine hundred and ninety-nine years.

3. That its particular business and objects are to promote the cause of fish culture; to gather and diffuse information bearing upon its practical success, and upon all matters relating to the fisheries; to unite and encourage all interests of fish culture and the fisheries; and to treat all questions of a scientific and economic character regarding fish with power:

(*a*) To acquire, hold and convey real estate and other property, and to establish general and special funds.

(*b*) To hold meetings.

(*c*) To publish and distribute documents.

(*d*) To conduct lectures.

(*e*) To conduct, endow, or assist investigation in any department of fishery and fish-culture science.

(*f*) To acquire and maintain a library.

(*g*) And, in general, to transact any business pertinent to a learned society.

4. That the affairs, funds and property of the corporation shall be in general charge of a council, consisting of the officers and the executive committee, the number of whose members for the first year shall be seventeen, all of whom shall be chosen from among the members of the Society.

Witness our hands and seals this 16th day of December, 1910.

| | |
|---|---|
| SEYMOUR BOWER | (Seal) |
| THEODORE GILL | (Seal) |
| WILLIAM E. MEEHAN | (Seal) |
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**Recorded April 16, 1911.**

# AMERICAN FISHERIES SOCIETY

ORGANIZED 1870

The first meeting of the Society occurred December 20, 1870. The organization then effected continued until February, 1872, when the second meeting was held. Since that time there has been a meeting each year, as shown below. The respective presidents were elected at the meeting, at the place, and for the period shown opposite their names, but they presided at the subsequent meeting.

PRESIDENTS, TERMS OF SERVICE AND PLACES OF MEETING.

| | | | |
|---|---|---|---|
| 1. | WILLIAM CLIFT | 1870–1872 | New York, N. Y. |
| 2. | WILLIAM CLIFT | 1872–1873 | Albany, N. Y. |
| 3. | WILLIAM CLIFT | 1873–1874 | New York, N. Y. |
| 4. | ROBERT B. ROOSEVELT | 1874–1875 | New York, N. Y. |
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| 6. | ROBERT B. ROOSEVELT | 1876–1877* | New York, N. Y. |
| 7. | ROBERT B. ROOSEVELT | 1877–1878 | New York, N. Y. |
| 8. | ROBERT B. ROOSEVELT | 1878–1879 | New York, N. Y. |
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| 12. | GEORGE SHEPARD PAGE | 1882–1883 | New York, N. Y. |
| 13. | JAMES BENKARD | 1883–1884 | New York, N. Y. |
| 14. | THEODORE LYMAN | 1884–1885 | Washington, D. C. |
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| 16. | W. M. HUDSON | 1886–1887 | Chicago, Ill. |
| 17. | WILLIAM L. MAY | 1887–1888 | Washington, D. C. |
| 18. | JOHN H. BISSELL | 1888–1889 | Detroit, Mich. |
| 19. | EUGENE G. BLACKFORD | 1889–1890 | Philadelphia, Pa. |
| 20. | EUGENE G. BLACKFORD | 1890–1891 | Put-in-Bay, Ohio. |
| 21. | JAMES A. HENSHALL | 1891–1892 | Washington, D. C. |
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| 23. | HENRY C. FORD | 1893–1894 | Chicago, Ill. |
| 24. | WILLIAM L. MAY | 1894–1895 | Philadelphia, Pa. |
| 25. | L. D. HUNTINGTON | 1895–1896 | New York, N. Y. |
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| 27. | WILLIAM L. MAY | 1897–1898 | Detroit, Mich. |
| 28. | GEORGE F. PEABODY | 1898–1899 | Omaha, Neb. |
| 29. | JOHN W. TITCOMB | 1899–1900 | Niagara Falls, N. Y. |
| 30. | F. B. DICKERSON | 1900–1901 | Woods Hole, Mass. |
| 31. | E. E. BRYANT | 1901–1902 | Milwaukee, Wis. |
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| 33. | FRANK N. CLARK | 1903–1904 | Woods Hole, Mass. |
| 34. | HENRY T. ROOT | 1904–1905 | Atlantic City, N. J. |
| 35. | C. D. JOSLYN | 1905–1906 | White Sulphur Spgs, W.Va. |
| 36. | E. A. BIRGE | 1906–1907 | Grand Rapids, Mich. |
| 37. | HUGH M. SMITH | 1907–1908 | Erie, Pa. |
| 38. | TARLETON H. BEAN | 1908–1909 | Washington, D. C. |
| 39. | SEYMOUR BOWER | 1909–1910 | Toledo, Ohio. |
| 40. | WILLIAM E. MEEHAN | 1910–1911 | New York, N. Y. |
| 41. | S. F. FULLERTON | 1911–1912 | St. Louis, Mo. |
| 42. | CHARLES H. TOWNSEND | 1912–1913 | Denver, Colo. |
| 43. | HENRY B. WARD | 1913–1914 | Boston, Mass. |
| 44. | DANIEL B. FEARING | 1914–1915 | Washington, D. C. |
| 45. | JACOB REIGHARD | 1915–1916 | San Francisco, Cal. |
| 46. | GEO. W. FIELD | 1916–1917 | New Orleans, La. |
| 47. | HENRY O'MALLEY | 1917–1918 | St. Paul, Minn. |

* A special meeting was held at the Centennial Grounds, Philadelphia, Pa., October 6 and 7, 1876.

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# The American Fisheries Society

## LIST OF MEMBERS, 1917-1918

**Showing Year of Election to Membership**

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'14 ALEXANDER, M. L., President, Louisiana Conservation Commission, New Orleans, La.
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'15 Shebley, W. H., Sisson, Cal.
'13 Shellford, Victor E., Dept. Zool., University of Illinois, Urbana, Ill.
'11 Shira, Austin F., U. S. Bureau of Fisheries, Fairport, Iowa.
'08 Shiras, Geo., 3d, Stoneleigh Court, Washington, D. C.

'13 SINGLETON, J. ERNEST, Woonsocket, R. I.
'03 *SLADE, GEORGE P., 309 Broadway, P. O. Box 283, New York City.
'17 SMITH, G. A., Oklahoma City, Okla.
'13 SMITH, HERBERT C., White Cloud, Mich.
'91 SMITH, DR. HUGH M., U. S. Commissioner of Fisheries, Washington, D. C.
'99 SMITH, LEWIS H., Algona, Iowa.
'05 SNYDER, J. P., U. S. Bureau of Fisheries, Cape Vincent, N. Y.
'08 SPEAKS, JOHN C., Chief Warden Fish and Game Commission, Columbus, Ohio.
'87 SPENSLEY, CALVERT, Mineral Point, Wis.
'17 SPORTSMENS REVIEW PUBLISHING CO., 15 W. Sixth St., Cincinnati, Ohio.
'16 SPRAGLE, L. H., Henryville, Pa.
'10 STACK, F. GEORGE, "Kamp Kill Kare," Raquette Lake, N. Y.
'04 STAPLETON, M. F., Supt., Cedar Island Lodge, Brule, Douglas Co., Wis.
'15 STARR, C. D., Lewis Bldg., Portland, Oregon.
'00 STARR, W. J., State Board of Fish Commissioners, Eau Claire, Wis.
'03 STEELE, G. F., Sun Life Bldg., Montreal, Canada.
'11 STERETT, W. G., State Game, Fish and Oyster Commission, Port Lavaca, Texas.
'03 STEVENS, ARTHUR F., Ramapo, N. Y.
'12 STIVERS, D. GAY, Butte Anglers' Association, Butte, Mont.
'14 STONE, DR. WILLARD J., 3 Harold Arms, Toledo, Ohio.
'04 STORY, JOHN A., U. S. Bureau of Fisheries, Green Lake, Me.
'16 STRONNER, JESSE LEE, Orangeburg, S. C.
'14 STRUVEN, CHAS. M., 114 S. Frederick St., Baltimore, Md.
'16 STUCKE, EDWIN W., 3811 Brown St., Philadelphia, Pa.
'13 SULLIVAN, WALTER E., Tufts School of Medicine, Boston, Mass.
'04 SURBUR, THADDEUS, U. S. Bureau of Fisheries, Homer, Minn.
'15 SUTRO, ADOLPH NEWTON, 1155 Pine St., San Francisco, Cal.
'10 SWORD, C. B., New Westminster, British Columbia, Canada.

'04 TALBOT, HENRY, Interstate Commerce Commission, Washington, D. C.
'13 THAU, AUGUST B., 521 W. 29th St., Indianapolis, Ind.
'99 THAYER, W. W., U. S. Bureau of Fisheries, Northville, Mich.
'06 THOMAS, W. H., U. S. Bureau of Fisheries, Fairport, Iowa.
'13 THOMAS, ADRIAN, 2012 Hanover Ave., Richmond, Va.
'00 THOMPSON, W. P., 123 N. Fifth St., Philadelphia, Pa.
'00 THOMPSON, W. T., U. S. Bureau of Fisheries, Bozeman, Mont.
'08 THOMSON, G. H., Estes Park, Colo.
'13 TICHENOR, A. K., Secretary Alaska Packers' Assn., San Francisco, Cal.
'14 TILLMAN, ROBERT T., Beacon Paper Co., St. Louis, Mo.
'13 *TIMSON, WM., Vice-President, Alaska Packers' Assn., San Francisco, Cal.
'92 TITCOMB, JOHN W., Conservation Commission, Albany, N. Y.
'11 TONGUE, LEONARD M., 906 American Bldg., Baltimore, Md.
'14 TORREY, PROF. HARRY BEAL, Reed College, Portland, Ore.
'01 *TOWNSEND, DR. CHARLES H., Director New York Aquarium, New York, N. Y.
'13 TREXLER, COL. HARRY C., Allentown, Pa.
'13 TRIGGS, CHAS. W., Booth Fisheries Co., 22 W. Monroe St., Chicago, Ill.
'15 TROYER, M., Astoria Iron Works, Seattle, Wash.
'16 TRULL, HARRY S., 317 E. 196th St., Fordham, N. Y.
'99 TUBBS, FRANK A., U. S. Bureau of Fisheries, Mammoth Spring, Ark.
'98 TULIAN, EUGENE A., Box 1267, New Orleans, La.
'13 TURNER, CHAS. C., Judge Kentucky Court of Appeals, Frankfort, Ky.
'13 TYSON, JAS. W., Connecticut Fish and Game Commission, Hartford, Conn.

'11 *VALLETTE, LUCIANO H., Chief of Section of Fish Culture, 827 Rivadavia, Buenos Aires, Argentina.
'09 VAN ATTA, CLYDE H., U. S. Bureau of Fisheries, Yes Bay Hatchery, Ketchikan, Alaska.
'14 *VANDERGRIFT, S. H., 1728 New Hampshire Ave., Washington, D. C.
'13 VARDEN, GEO. S., Paris, Ky.
'10 VILES, BLAINE S., Inland Fish and Game Commissioner, Augusta, Me.
'14 VOGEL, J. C., 2203 Pearl St., Philadelphia, Pa.
'12 VOGT, JAMES H., Nevada Fish Commission, Carson City, Nevada.
'09 VON LENGERKE, J., 200 Fifth Ave., New York City.

'06 WADDELL, JOHN, Grand Rapids, Mich.
'15 WAKEFIELD, L. H., 1310 Smith Bldg., Seattle, Wash.
'96 WALKER, BRYANT, Detroit, Mich.
'11 WALKER, DR. H. T., 210 Main St., Denison, Texas.
'16 WALLACE, FREDERICK WILLIAM, 600 Read Bldg., 45 St. Alexander St., Montreal, Quebec, Canada.
'96 WALTERS, C. H., Cold Spring Harbor, N. Y.
'98 WARD, PROF. H. B., University of Illinois, Urbana, Ill.
'12 WARD, J. QUINCY, Executive Agent, Kentucky Game and Fish Commission, Frankfort, Ky.
'17 WARD, ROBERTSON S., 172 Harrison St., East Orange, N. J.
'14 WASHBURN, PROF. F. L., 1112 Sixth St., S. E., Minneapolis, Minn.
'17 WATTS, A. E., 9 T Wharf, Boston, Mass.
'13 WEBB, W. SEWARD, 44th St. and Vanderbilt Ave., New York City.
'16 WEEKS, ANDREW GRAY, 8 Congress St., Boston, Mass.
'13 WEIL, WALTER G., Majestic Bldg., Chicago, Ill.
'15 WEIS, CAPT. JAS. E., St. Joseph, Mo.
'15 WEISE, ENGLEBERG, Seattle, Wash.
'13 WELSH, WM. W., Scientific Assistant U. S. Bureau of Fisheries, Washington, D. C.
'17 WELSCH, H. N., Box 4, Salt Lake City, Utah.
'15 WELSCH, R., Bellingham, Wash.
'13 WESTERFELD, CARL, New Call Bldg., San Francisco, Cal.
'13 WESTERMANN, J. H., Harrietta, Mich.
'01 WHEELER, CHARLES STETSON, Union Trust Building, San Francisco, Cal.
'15 WHEELER, FRED. M., 546 Fulton St., Chicago, Ill.
'96 WHITE, R. TYSON, 320 Bridge St., Brooklyn, N. Y.
'10 WHITMAN, EDWARD C., Canso, Nova Scotia, Canada.
'15 WHITESIDE, R. B., 204 Sellwood Bldg., Duluth, Minn.
'17 WILLIAMS, J. A., State Board of Health Bldg., Tampa, Fla.
'01 WILSON, C. H., Glen Falls, N. Y.
'11 WILSON, J. S. P. H., Chairman, Board of Inland Game and Fish Commissioners, Auburn, Me.
'10 WINCHESTER, GRANT E., Forest, Fish and Game Commission, Bemus Point, N. Y.
'00 WINN, DENNIS, U. S. Bureau of Fisheries, 1217 L. C. Smith Bldg., Seattle, Wash.
'13 WINTER, J. H., Alaska Packers' Association, San Francisco, Cal.
'99 WIRES, S. P., U. S. Bureau of Fisheries, Duluth, Minn.
'13 *WISNER, J. NELSON, Director, Institute de Pesca del Uruguay, Punta del Esto, Uruguay.
'05 *WOLTERS, CHAS. A., Oxford and Marvine Streets, Philadelphia, Pa.
'97 WOOD, C. C., Plymouth, Mass.
'13 WOODS, JOHN P., President, Missouri State Fish Commission, First and Wright Sts., St. Louis, Mo.
'14 WORK, GERALD, Perkins Hill, Akron, Ohio.
'84 WORTH, S. G., 518 Colonial Ave., Norfolk, Va.

'09 YERINGTON, EDWARD B., Board of Fish Commissioners, Carson City, Nevada.
'16 YOUNGER, R. J., Houma, La.

'99 ZALSMAN, P. G., Grayling, Mich.

*Supplementary List, Dating from 1918 Meeting.*

BAILEY, ARTHUR T., Nashua, N. H.
BELLISLE, J. A., Inspector General of Fisheries and Game, Quebec, Canada.
BILISOLY, E. NASH, 517 Law Bldg., Norfolk, Va.
BRIGGS, ARTHUR, Supt. Maine Hatcheries, Winthrop, Me.
BURNHAM, JOHN B., Pres. Am. Game Protective Assoc'n, 233 Broadway, New York, N. Y.
CAYAHOGA COUNTY SPORTMENS' ASSOCIATION, (JOHN L. ALNUTT, President), Auburn, N. Y.
COYKENDALL, EDWARD, 22 Ferry St., Kingston, N. Y.
DURANT, DR. E. W., Chairman, Board of Fisheries of S. C., Georgetown, South Carolina.
FARRELL, JOHN J., 3283 Sixth Ave., Troy, N. Y.
FRENCH, ALBERT, International Agricultural Corporation, 61 Broadway, New York, N. Y.
FRIDENBERG, ROBERT, 22 W. 56th St., New York, N. Y.
GREEN, MAJOR HUGH A., Room 211, St. Nicholas Bldg., Montreal, Canada.
HAUSCHILDT, CHARLES, Timmins, Ontario, Canada.
HAWKS, S. B., County Warden and Hatchery Supt., Bennington, Vt.
IRONDEQUOIT FISH AND GAME ASSOCIATION, (J. W. JOHNSTON, Cor. Sec.), Rochester, N. Y.
KIPPENDORF, CARL H., Sagamore and New Sts., Cincinnati, Ohio.
MCINTYRE, GEO. A., Fish and Game Commissioner, Milford, N. H.
MACKENZIE, WM. M., The Linen Thread Co., 96 Franklin St., New York, N. Y.
MOORE, EMMELINE, Vassar College, Poughkeepsie, N. Y.
MORLEY, E. C., Sodus Point, N. Y.
MULLIN, WM. K., Bridgeport, Conn.
NEEDHAM, PROF. JAS. G., Cornell University, Ithaca, N. Y.
REW, JOHN R., Commissioner of Fisheries, Norfolk, Va.
RICHARDSON, A. P., Supt. of Fish Hatchery, Canaan, Vt.
ROBERTSON, ALEXANDER, Dominion Salmon Hatchery, Harrison Hot Springs, B. C., Canada.
SEAMAN, FRANK, Napanoch, N. Y.
SUN, DR. F. T., President, School of Fisheries, Tientsin, China.
THOMPSON, W. F.

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RECAPITULATION.

| | |
|---|---|
| Honorary | 68 |
| Corresponding | 14 |
| Patrons | 53 |
| Active | 624 |
| Total | 759 |

# CONSTITUTION

(As amended to date)

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## ARTICLE I

### NAME AND OBJECT

The name of this Society shall be American Fisheries Society. Its object shall be to promote the cause of fish culture; to gather and diffuse information bearing upon its practical success, and upon all matters relating to the fisheries; the uniting and encouraging of all interests of fish culture and the fisheries, and the treatment of all questions regarding fish, of a scientific and economic character.

## ARTICLE II

### MEMBERSHIP

*Active Members.*—Any person may, upon a two-thirds vote and the payment of two dollars, become a member of this Society. In case members do not pay their fees, which shall be two dollars per year after first year, and are delinquent for two years, they shall be notified by the treasurer, and if the amount due is not paid within a month thereafter, they shall be, without further notice, dropped from the roll of membership.

Any library, sporting or fishing club, society, firm or corporation may upon two-thirds vote and the payment of the regular annual fee, become a member of this Society and entitled to all its publications.

*Life Members.*—Any person shall, upon a two-thirds vote and the payment of twenty-five dollars, become a life member of this Society, and shall thereafter be exempt from all annual dues.

*Patrons.*—Any person, society, club, firm or corporation, on approval by the Executive Committee and on payment of $50.00,

may become a Patron of this Society with all the privileges of a life member, and then shall be listed as such in all published lists of the Society. The money thus received shall become part of the permanent funds of the Society and the interest alone be used as the Society shall designate.

*Honorary and Corresponding Members.*—Any person can be made an honorary or a corresponding member upon a two-thirds vote of the members present at any regular meeting.

The President (by name) of the United States and the Governors (by name) of the several States shall be honorary members of the Society.

*Election of Members Between Annual Meetings.*—The President, Recording Secretary and Treasurer of the Society are hereby authorized, during the time intervening between annual meetings, to act on all individual applications for membership in the Society, a majority vote of the Committee to elect or reject such applications as may be duly made.

## ARTICLE III

### SECTIONS

On presentation of a formal written petition signed by one hundred or more members, the Executive Committee of the American Fisheries Society may approve the formation in any region of a Section of the American Fisheries Society to be known as the ——— Section.

Such a Section may organize by electing its own officers, and by adopting such rules as are not in conflict with the Constitution and By-Laws of the American Fisheries Society.

It may hold meetings and otherwise advance the general interests of the Society, except that the time and place of its annual meeting must receive the approval of the Executive Committee of the American Fisheries Society, and that without specific vote of the American Fisheries Society, the Section shall not commit itself to any expression of public policy on fishing matters.

It may further incur indebtedness to an amount necessary for the conduct of its work not to exceed one-half of the sum received in annual dues from members of said section.

Such bills duly approved by the Chairman and Recorder of the Section shall be paid on presentation to the Treasurer of the American Fisheries Society.

## ARTICLE IV

### OFFICERS

The officers of this Society shall be a president and a vice-president, who shall be ineligible for election to the same office until a year after the expiration of their term; a corresponding secretary, a recording secretary, an editor, a treasurer, and an executive committee of seven, which, with the officers before named, shall form a council and transact such business as may be necessary when the Society is not in session—four to constitute a quorum.

In addition to the officers above named there shall be elected annually five vice-presidents who shall be in charge of the following five divisions or sections:

1. Fish culture.
2. Commercial fishing.
3. Aquatic biology and physics.
4. Angling.
5. Protection and legislation.

Vice-presidents of sections are expected to present reports at each annual meeting.

## ARTICLE V

### MEETINGS

The regular meeting of the Society shall be held once a year, the time and place being decided upon at the previous meeting, or, in default of such action, by the executive committee.

## ARTICLE VI

### ORDER OF BUSINESS

1. Call to order by president.
2. Roll call of members.
3. Applications for membership.
4. Reports of officers.
   a. President.
   b. Secretary.
   c. Treasurer.
   d. Vice-Presidents of Divisions.
   e. Standing Committees.
5. Committees appointed by the president.
   a. Committee of five on nomination of officers for ensuing year.
   b. Committee of three on time and place of next meeting.
   c. Auditing committee of three.
   d. Committee of three on programme.
   e. Committee of three on publication.
   f. Committee of three on publicity.
6. Reading of papers and discussion of same.
   (Note—In the reading of papers preference shall be given to the members present.)
7. Miscellaneous business.
8. Adjournment.

## ARTICLE VII

### CHANGING THE CONSTITUTION

The constitution of the Society may be amended, altered or repealed by a two-thirds vote of the members present at any regular meeting, provided at least fifteen members are present at said regular meeting.

## EDITORIAL.

**The Annual Meeting.** On September 9, 10 and 11, the forty-eighth annual meeting of the Society was held in the Waldorf-Astoria Hotel, New York City, with an attendance of about seventy-five members. Twenty-eight new members were elected bringing the total active membership to six hundred and twenty-four.

The meeting was marked by unusual earnestness in the consideration and discussion of problems. It may be safely said that never in the history of the society has there been a program more thoroughly scientific in character, nor, at the same time, one of greater importance in practical fisheries work.

The important problem of pollution, the discussion of which was led by Prof. Henry B. Ward's paper, naturally absorbed its full share of time at the meeting. The question of foods for the artificial feeding of fishes also evoked lively discussion, centering around important papers by Prof. G. C. Embody of Cornell University, and Dr. Sergius Morgulis of Creighton University.

The paper by Prof. Embody, entitled "Results of Some Trout Feeding Experiments," was awarded the prize among the competitive contributions on "Fish Culture." Dr. Morgulis was the recipient of the prize in "Biological Investigation" on his paper, "Studies on the Nutrition of Fish—Experiments on Brook Trout." No prize was awarded in the class "Commercial Fisheries," the only paper offered in competition being later withdrawn as not meeting the requirements. The offering of these prizes is a new feature of the Society's work and they will probably be offered again. The interest from the Permanent Fund—the accumulated fees of Patrons—provided the money for the prizes, one hundred dollars in each of the classes mentioned.

Officers for 1918–19 were elected as follows: President, Mr. M. L. Alexander, New Orleans, La.; Vice-President, Mr. Carlos Avery, St. Paul, Minn.; Recording Secretary, Mr. John P. Woods, St. Louis, Mo.; Treasurer, Mr. A. L. Millett, Gloucester, Mass.; Editor, Prof. Raymond C. Osburn, Columbus, Ohio; and Chairman of the Executive Committee, Mr. N. R. Buller, Harrisburg, Pa.

A full account of the meeting will appear later in the Proceedings.

R. C. O.

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